4. PRODUCTION, IMPORT/EXPORT, USE, AND DISPOSAL

4.1 PRODUCTION

1,4-Dichlorobenzene is produced by the chlorination of benzene or chlorobenzene in the presence of a catalyst (typically ferric oxide) followed by either fractional distillation or crystallization of the resulting mixture of chlorinated benzenes to yield 1,4-dichlorobenzene (HSDB 1998; IRPTC 1985).

The volume of 1,4-dichlorobenzene produced in the United States in 1972, 1975, 1977, and 1981 was estimated to be 35 million kg (77.2 million pounds), 20.8 million kg (45.9 million pounds), 16-116 million pounds (7.25-52.6 million kg), and 15 million pounds (6.8 million kg), respectively (HSDB 1998). The production of 1,4-dichlorobenzene steadily increased from 1980 to 1989 at a rate of about 2% per year (Chemical Marketing Reporter 1990). The production volume of 1,4-dichlorobenzene increased from 1984 to 1994 at a rate of 4% annually. The production volume was 4.264 (1984), 4.779 (1985), 5.035 (1986), 5.155 (1987), 5.601 (1988), 5.344 (1989), 5.200 (1990), 5.350 (1991), 5.656 (1992), 5.791 (1993), and 6.227 billion pounds (1994) (C&EN 1995).

1,4-Dichlorobenzene is currently produced by 3 U.S. companies at 3 different locations: Monsanto Company, in Sauget, Illinois; PPG Industries, Inc., in Natrium, West Virginia; and Standard Chlorine of Delaware, Inc., in Delaware City, Delaware (SRI 1997). Current annual production capacity for the Monsanto Company, PPG Industries, Inc., and Standard Chlorine Chemical Company is 33, 36, and 75 million pounds, respectively (SRI 1996). Total annual production capacity has fluctuated during the last decade. The annual production capacity was 132, 127,371, 138, and 144 million pounds in 1988, 1994, 1995, 1996, and 1997 respectively (SRI 1988, 1994, 1995, 1996, 1997).

Table 4-l lists the facilities in each state that manufacture or process 1,4-dichlorobenzene, the intended use, and the range of maximum amounts of 1,4-dichlorobenzene that are stored on site. The data listed in Table 4-l are derived from the Toxics Release Inventory (TRI96 1998). Only certain types of facilities were required to report (EPA 1997b). Therefore, this is not an exhaustive list.

Table 4-1. Facilities That Manufacture or Process 1,4-Dichlorobenzene

FACILITY	LOCATION [a]	RANGE OF MAXIMUM AMOUNTS ONSITE IN POUNDS	ACTIVITIES AND USES
BAY STATE STERLING	NORTH MANCHESTER , IN	1,000 - 9,999	MANUFACTURING AID
BAY STATE STERLING	WESTBOROUGH , MA	1,000 - 9,999	MANUFACTURING AID
CAROLINA SOLITE CORP.	NORWOOD , NC	1,000 - 9,999	ANCILLARY/OTHER USE
COUGHLAN PRODS. CORP.	CLIFTON , NJ	10,000 - 99,999	FORMULATION COMPONENT
COUGHLAN PRODS. CORP.	WAYNE , NJ	10,000 - 99,999	FORMULATION COMPONENT
COUGHLAN PRODS. CORP.	PATERSON , NJ	10,000 - 99,999	FORMULATION COMPONENT
CREST PRODS. INC.	OLDSMAR , FL	10,000 - 99,999	FORMULATION COMPONENT
DOW CHEMICAL CO.	PLAQUEMINE , LA	1,000 - 9,999	PRODUCE , IMPURITY
FORTRON IND.	WILMINGTON , NC	100,000 - 999,999	REACTANT
FRESH PRODS. INC.	TOLEDO , OH	10,000 - 99,999	IMPORT , SALE/DIST., REPACKAGING , ANCILLARY/OTHER USE
FULLER BRUSH CO.	GREAT BEND , KS	100,000 - 999,999	FORMULATION COMPONENT
HEARTLAND CEMENT CO.	INDEPENDENCE , KS	100 - 999	ANCILLARY/OTHER USE
HOSPITAL SPECIALTY CO.	CLEVELAND , OH	100,000 - 999,999	ARTICLE COMPONENT
I. SCHNEID INC.	ATLANTA , GA	10,000 - 99,999	ARTICLE COMPONENT , REPACKAGING
MONSANTO	SAUGET , IL	1,000,000 - 9,999,999	PRODUCE , SALE/DISTRIBUTION
NIPA HARDWICKE INC.	ELGIN , SC	10,000 - 99,999	REACTANT
PHILLIPS CHEMICAL CO.	BORGER , TX	100,000 - 999,999	REACTANT
PHILLIPS RESEARCH CENTER	BARTLESVILLE , OK	1,000 - 9,999	REACTANT
PPG IND. INC.	NEW MARTINSVILLE , WV	1,000,000 - 9,999,999	PRODUCE , SALE/DISTRIBUTION
STANDARD CHLORINE OF DE	DELAWARE CITY , DE	10,000,000 - 49,999,999	PRODUCE , ON-SITE USE/PROCESSING , SALE/DIST., REACTANT
WILLERT HOME PRODS.	SAINT LOUIS , MO	100,000 - 999,999	ARTICLE COMPONENT

Source: TRI96 1998

[a] Post Office state abbreviations used

4.2 IMPORT/EXPORT

In 1978, about $1.09x10^4$ kg (24,030 pounds) of 1,4-dichlorobenzene were imported into the United States (HSDB 1998; NTP 1989). Recent import volumes increased almost 3-fold during 1993 and 1994 compared to the period from 1990 to 1992 (NTDB 1996). Import volumes of 1,4-dichlorobenzene were 867,441 kg (1.9 million pounds), 1,113,676 kg (2.5 million pounds), 996,649 kg (2.2 million pounds), 3,283,759 kg (7.2 million pounds), and 3,019,233 kg (6.7 million pounds) for 1990, 1991, 1992, 1993, and 1994, respectively.

In 1972, U.S. exports of 1,4-dichlorobenzene were reported to be $4.5x10^6$ kg (9.9 million pounds) (HSDB 1998). Exports of 1,4-dichlorobenzene have expanded through the 1980s at about l-2% per year due to the growth in production of polyphenylene sulfide (PPS) resin overseas (HSDB 1998; NTP 1989). In 1990, the United States exported about 25% (about 33 million pounds) of its 1,4-dichlorobenzene production volume (Chemical Marketing Reporter 1990). Recent export volumes from 1990 to 1995 have remained relatively constant (NTDB 1996). Export volumes of 1,4-dichlorobenzene were 11,925,179 kg (24.1 million pounds), 11,185,034 kg (24.7 million pounds), 10,651,337 kg (23.5 million pounds), 13,390,545 kg (295 million pounds), and 11,078,150 kg (24.4 million pounds) for 1990, 1991, 1992, 1993, and 1994, respectively.

4.3 USE

For the past 20 years, 1,4-dichlorobenzene has been used principally (35-55% of all uses) as a space deodorant for toilets and refuse containers, and as a fumigant for control of moths, molds, and mildews. A significant amount of 1,4-dichlorobenzene is exported (34%), with lesser amounts used in the production of polyphenylene sulfide (PPS) resin (approximately 27% of its total use), and as an intermediate in the production of other chemicals such as 1,2,4-trichlorobenzene (approximately 10%). Minor uses of 1,4-dichlorobenzene also include its use in the control of certain tree-boring insects and ants, and in the control of blue mold in tobacco seed beds (Chemical Marketing Reporter 1990; HSDB 1998).

4.4 DISPOSAL

Wastes containing 1,4-dichlorobenzene are considered hazardous if they meet certain criteria specified by law. Hazardous wastes are subject to the handling, transport, treatment, storage, and disposal regulations as promulgated under the Resource Conservation and Recovery Act (HSDB 1998; IRPTC 1985). Regulations governing the treatment and disposal of wastes containing 1,4-dichlorobenzene are detailed in Chapter 7.

Incineration by appropriate means is the recommended method for the disposal of waste 1,4-dichlorobenzene (HSDB 1998). 1,4-Dichlorobenzene may be disposed of by making packages of the chemical in paper or other disposable material and burning in a suitable combustion chamber equipped with an appropriate effluent gas cleaning device or by dissolving the chemical in a flammable solvent (such as alcohol) and atomizing in a suitable combustion chamber equipped with an appropriate effluent gas cleaning device (IRPTC 1985). Halogenated compounds may be disposed of by incineration provided they are blended with other compatible wastes or fuels so that the composite contains less than 30% halogens. Liquid injection, rotary kiln, and fluidized bed incinerators are typically used to destroy liquid halogenated wastes. Temperatures of at least 2,000-2,200 °F and residence times of seconds for liquids and gases, and hours for solids (HSDB 1998).

No data were located regarding historic disposal trends or the amounts of 1,4-dichlorobenzene disposed of by different means. According to the most recent Toxics Release Inventory (TRI96 1998), a total of 762,085 pounds of 1,4-dichlorobenzene were released to the environment. Of this total, 521,143 pounds of 1,4-dichlorobenzene wastes were transferred off-site (presumably for incineration), 79 pounds were sent to publicly owned treatment works (POTWs), 2,000 pounds were released via underground injection, 480 pounds were released to land, 1,881 pounds were released to water, and 236,502 pounds were released to air in 1996.